more from the point of view of a teacher, and, in its early chapters, the theory of the internal-combustion engine is developed on the assumption of a constant specific heat. Later the variation of the specific heat with temperature is discussed in general terms, and the results of Clerk, Mallard, and Le Chatelier are given.

The principal feature of the work, however, is the very full account of the growth and development of the internal-combustion engine in America.

All the well-known types are described and generally very fully illustrated. In this respect the work is somewhat encyclopædic in character, and ought rather to be regarded as a reference book than a text-book. The same remark applies to other sections devoted to fuels, testing of engines, methods of regulation, gas-engine auxiliaries, and the like. In all these we find a mass of information, with copious references to the original sources.

Anyone wishing to obtain a good general idea of present-day practice in America will find this book a valuable work. E. G. COKER.

OUR BOOK SHELF.

Abhandlungen zur Physiologie der Gesichtsempfindungen aus dem physiologischen Institut zu Freiburg-i-B. Herausgegeben von J. von Kries. Drittes Heft. Pp. 192. (Leipzig: Verlag von J. A. Barth, 1908.) Price 6 marks.

THIS volume comprises the third series of collected papers from the laboratory of Prof. von Kries at Freiburg. The communications have all been previously published in the *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, the earliest having appeared in 1903. It is doubtful whether their republication in this form will lead to recognition by a larger audience, not because of any lack of inherent excellence, but rather because of their highly specialised nature.

The first paper is an interesting note on the perception of flicker in normal and totally colour-blind persons. The researches of Schaternikoff tend to show that the retinal rods possess a lower sensitivity for rapid periodic variation in the intensity of the incident light than the cones; hence more rapid rotation of the disc in the usual method of eliciting the flicker phenomenon is necessary to produce complete fusion with the eye adapted for light than with the dark adapted eye. It became of interest, therefore, to investigate the behaviour of the totally colour-blind eye in these circumstances. At the suggestion of Prof. von Kries, who had not a suitable case under his observation, Prof. Uhthoff carried out some investigations. He found that much more rapid rotation—about three times—was necessary with the normal eye to eliminate flicker than with the totally colour-blind eye.

Porter has investigated the relationship between the intensity of illumination and the frequency of change necessary to eliminate flicker. He found that the curves representing this relationship show two parts, each nearly straight, but having two different constants. These curves are analogous to those obtained by König for the relationship between visual acuity and intensity of illumination. In the one case the fusion frequency, in the other the visual acuity, is proportional to the logarithm of the illumination. Both, therefore, behave in identical fashion: with the smallest intensities of light both increase slowly; at approximately the same intensity a much more rapid increase suddenly becomes apparent. The simplest explanation of these phenomena is that there are two mechanisms at work, one of which is influenced by light of low, the other by light of higher, intensity.

In succeeding papers Dr. Wilhelm Trendelenburg records quantitative estimates of the bleaching of visual purple by monochromatic light and (with Dr. Roswell P. Angier) of mixtures of complementary colours to form white. Siebeck has investigated the intensity of monochromatic light in extremely small fields, so small, in fact, as to eliminate the colour element (Minimalfeldhelligkeit). Prof. von Kries, in a paper founded on observations by Dr. Eyster, calculates in absolute terms the energy necessary for stimulation of the retina, and Dr. F. P. Boswell applies the same principles to the fovea. They thus attempt what has already been done for the ear by Lord Rayleigh and others. Other papers on colour mixtures and colour memory will repay perusal, and Prof. von Kries describes a simple apparatus for the mixture of monochromatic lights which may be commended to the notice of teachers of physiological psychology.

Fresh-water Algae from Burma, including a few from Bengal and Madras. By W. West and G. S. West. Pp. 175–260; 7 plates. (Annals of the Royal Botanic Garden, Calcutta, vol. vi., part ii.) Price Rs. 10, or 15*s*.

THE material was collected in certain districts of Burma, and a few species in the Burdwan district of Bengal and Vizagapatam district of Madras by Mr. I. H. Burkill, and was forwarded for determination by Lieut.-Col. Prain, at that time director of the Botanical Survey of India. The work is almost entirely systematic, as would be expected in dealing with material from districts where the algal flora was previously almost unknown, and has added very materially to our knowledge of the distribution of fresh-water algæ in the Indian region. Two new genera are described—Euastridium, a large and handsome Desmid. possessing peculiar morphological features, and Burkillia, belonging to the Protococcaceæ, occurring as free-floating colonies furnished with stout horns. Among the many new species described, *Mougeotia producta* is of special importance because of the presence of aplanospores in no way different from those which are found in the genus Gonatonema. In the last-named genus aplanospores only are formed, whereas in Mougeotia, aplanospores and spores, as a result of conjugation, are both present, hence it may be necessary to place Gonatonema merely as a section of the genus Mougeotia, in which spores resulting from conjugation have ceased to exist. *Urococcus tropicus* is remarkable in being green, whereas the cells of other species of the genus usually contain an abundance of a red-brown pigment.

The collection contained a number of interesting Desmids which, with previous records, are said to furnish material for a very interesting discussion on their distribution in the East Indies generally. Even from the knowledge forthcoming, certain Desmids appear to be confined to an area extending from India and Ceylon, across Burma and the Malay Peninsula to Sumatra and Java, and thence to Queensland.

As evidence of the wide geographical range of some species of algæ, *Nostoc humifusum*, first recorded from Scotland, and *Plectonema wollei*, from the United States, were included in the collection.

The number of varieties and forms hovering around many of the species suggests that, from the standpoint of de Vries, many incipient species are being produced.

The work is a perfect model of descriptive or systematic botany, combining a true sense of proportion, the authors' well-known grasp of their subject enabling them to deal primarily with the material under investigation, and, secondly, with the book phase of the subject known as synonymy.

Seven beautifully executed plates elucidate the text.

Trees: a Handbook of Forest-Botany for the Woodlands and the Laboratory. Vol. iv. Fruits. By the late Prof. H. Marshall Ward. Pp. iv+161. (Cambridge: University Press, 1908.) Price 4*s.* 6*d.* net.

IT was the intention of the author to complete this work in six volumes, but unhappily he was not spared to see the scheme accomplished. However, three excellent volumes, full of useful and interesting information, dealing respectively with buds, leaves, and flowers, had been published, and the author left behind sufficient manuscript for two other volumes. Prof. Groom undertook the task to see these two volumes through the press. A perusal of the present volume shows that the manuscript could not have fallen into better hands. The skill with which he has edited this part leaves nothing to be desired. Like its predecessors, vol. iv. is divided into two sections—a general and a special. The first section contains seven chapters. The first chapter gives an idea of what fruit is, its function and parts. In the second chapter is given a classification of fruits, and the remaining chapters of this section deal with the fruits of woody plants, each under its own natural order. In section ii. we have a tabular classification of trees and shrubs according to their fruits and seeds.

The many excellent illustrations given throughout the volume serve to enhance its value as a book for students and others who may wish to study fruits, and it will also be found of service for the purpose of reference.

The next and final volume is already in the press, and when issued will complete a monumental work on trees written by an enthusiast as only one who is imbued with the love of his subject can write.

"Trees," by Prof. Marshall Ward, will be found of use to the expert and student alike, while the beginner who has once started to read will soon find himself becoming enthusiastic under the inspiring influence of the writer.

A complete index has been compiled for this as well as for the other volumes by Mrs. Marshall Ward.

The Story of Iron and Steel. By J. Russell Smith. Pp. xi+193. (London: Appleton and Co., 1908.) Price 2*s.* 6*d.* net.

To all who are interested in the gradual development of our great iron industries, and especially the more recent development in America, this little volume may be of some interest. It, however, can hardly be said that the author has succeeded in carrying out the object he had in view, as stated in his preface, of presenting to intelligent persons a clear and concise description of the complex technical phenomena of iron- and steel-making. The author's apparent lack of detail technical knowledge has prevented his emphasising in his descriptions the fundamental principles involved in the various processes to which he refers. Thus, in dealing with the reduction of iron as it was practised during the various stages of development in passing from the catalan forge to the modern blast furnace, there is not the slightest suggestion made that there is any chemical reaction between the iron ores and the fuel employed, and the lay reader would go away with the impression that the only function of the carbon, in whatever form it was used, was to act as a heating agent.

On p. 99, in dealing with the quality of iron produced, he makes the statement that if the iron is *melted* at 800° centigrade, it will contain 1 per cent. of silicon, which is, of course, an absurdity, as this temperature is below the melting point of iron. A page or two further on he speaks of the hot blast being injected into the furnace at 800° or 1100° centigrade.

His description of the puddling furnace is of the crudest when he speaks of the carbon in the pig-iron being combustible and gradually burnt out by the flame, while no suggestion is made that the real oxidising agent is the oxide of iron added. In chapter xi., "On the New Steels and their Significance," in which he refers to various alloy-steels, he seems to be under the impression that the self-hardening properties of high-grade steel tools are a function of their melting points, and his statement as to certain influences of manganese on steel certainly has the single advantage of being distinctly novel.

It is to be regretted that the technical descriptions in this little volume are so inaccurate, as in other respects it is a very interesting synopsis of the progress of the iron and steel industry. Perhaps the most interesting portions of the book are those chapters dealing with the various causes which have influenced the great developments in recent years in America, and also induced the rise and growth of the great financial trusts that now so largely control steel manufacture in the States.

Physiological and Medical Observations among the Indians of South-western United States and Northern Mexico. By Aleš Hrdlička. Pp. ix+460. (Washington: Government Printing Office, 1908.)

THIS publication is a bulletin of the Bureau of American Ethnology (Smithsonian Institution), and comprises the result of observations among a large number of Indian tribes. It will prove a mine of useful information to those interested in anthropology, but, like the publications of most Government institutions, is hardly written in a manner to make it interesting to the general reader. It contains, for instance, nearly 200 pages of statistical tables. Its title—physiological and medical observations—is justified because the data collected include what is so often missing in books on ethnology, details not only of size, stature, date of puberty, rate of pulse, muscular development, and so forth, but also statistics relating to prevalent diseases and native methods of treatment. Not the least attractive feature of the work is a series of twenty-eight beautiful plates, which illustrate the physiognomy and dwellings of the native races, as well as other points interesting to those who study folk-lore.

The author appears to have spared no pains in carrying out his investigations.

Ernst Haeckel. Versuch einer Chronik seines Lebens und Wirkens. By Prof. Walther May. Pp. vii+301. (Leipzig: J. A. Barth, 1909.) Price 5·60 marks; bound, 6·60 marks.

THERE are already two biographies of Haeckel, but Prof. May's book is complementary to these, and written in a different mood. It aims at showing what the great naturalist has accomplished, from his first research in 1855 to the institution of the Phyletic Museum in 1907. The author gives a careful account of the chief results of Haeckel's books,